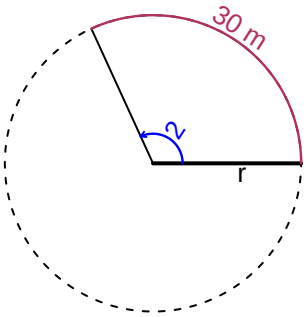
Name: Date:

Trig Final (SLTN v691)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 30 meters. The angle measure is 2 radians. How long is the radius in meters?

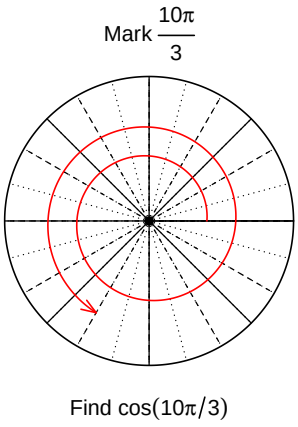


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

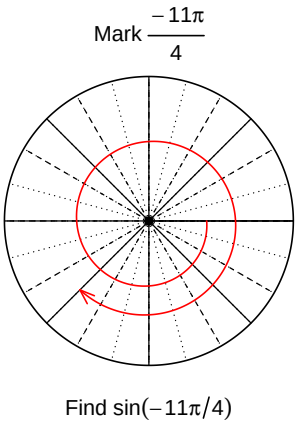
$r = 15$ meters.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{10\pi}{3}\right)$ and $\sin\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(10\pi/3)$



Find $\sin(-11\pi/4)$

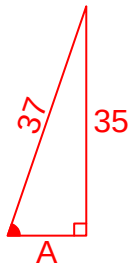
$\cos(10\pi/3) = \frac{-1}{2}$

$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-35}{37}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

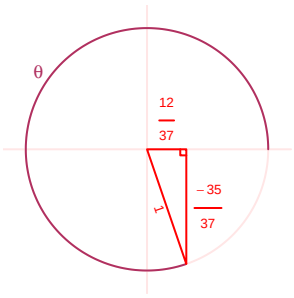
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 35^2 = 37^2$$
$$A = \sqrt{37^2 - 35^2}$$
$$A = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{12}{37}} = \frac{-35}{12}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.02 Hz, an amplitude of 8.46 meters, and a midline at $y = -2.22$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.46\sin(2\pi 7.02t) - 2.22$$

or

$$y = 8.46\sin(14.04\pi t) - 2.22$$

or

$$y = 8.46\sin(44.11t) - 2.22$$